

Genetics Problem Set #2 - Monohybrid and Dihybrid Crosses

Punnett Square Example: In pea plants, tall (T) is dominant over short (t). Cross a **pure** tall plant with a **pure** short plant. Find the genotype and phenotype ratios.

CROSS: TT x tt
genotype ratio: all hybrid (heterozygous)
phenotype ration: all tall

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|---|----|----|
| | T | T |
| t | Tt | Tt |
| t | Tt | Tt |

Simple Probability & Monohybrid Crosses:

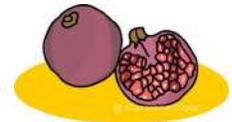
1) The Jones family has eight children, all of whom are girls. **What is the chance that the next child will be a boy? Explain.**

2) In pea plants, round seed shape (R) is dominant over wrinkled (r). Write the genotype and phenotype for a plant that is:

- a) heterozygous (hybrid): _____
- b) homozygous dominant (pure): _____
- c) homozygous recessive (pure): _____

3) Find the genotype and phenotype ratios expected from crossing two **heterozygous** plants from problem #1.

4) In a certain plant, yellow fruit (Y) is dominant to white fruit (y). A heterozygous plant with yellow fruit is crossed with a plant with white fruit. Find the genotype and phenotype ratios.



5) In horses, black color (B) is dominant over chestnut color (b). Find the genotype and phenotype ratios of a cross between a hybrid black horse and a chestnut horse. What is the probability that the offspring will be chestnut color?



6) In humans, normal pigmentation is due to a dominant factor "C," albinism to its recessive allele "c." A normal man marries an albino woman. Their first child is an albino.

(a) What are the genotypes of these three people?

man: _____ woman: _____ child: _____

(b) If they have more children, **what would they probably be like? (i.e. what % will be "normal" vs. albino?)**

Dihybrid Crosses:

TWO FACTOR CROSSES—DIHYBRID CROSSES

Crosses that involve 2 traits, such as pod color and pod shape, are called 2 factor crosses. Keep in mind that in 2 factor crosses the genes controlling the 2 different traits are located on different chromosomes, so that these nonhomologous chromosomes assort independently.

Use the following information to help you complete the rest of the problems.

In mice, the ability to run normally is a dominant trait. Mice with this trait are called running mice (R). The recessive trait causes mice to run in circles only. Mice with this trait are called waltzing mice (r). Hair color is also inherited in mice. Black hair (B) is dominant over brown hair (b).

7) Cross a homozygous running, homozygous black mouse with a heterozygous running, brown mouse.

8) Cross a waltzing brown mouse with a waltzing brown mouse.

9) Cross a homozygous running, heterozygous black mouse with a waltzing brown mouse.



MORE DIHYBRID PROBLEMS!

10) Hearing (D) is known to be dominant to a type of deafness (d), and having healthy metabolism (P) is known to be dominant to having the disease pku (p). A married couple -- let's call them Barbie and Ken -- have these phenotypes and genotypes.

Barbie is ddPP (deaf but normal metabolism)

Ken is Ddpp (can hear but he has pku)

They ask their genetic counselor, "What is the probability of our having a normal child (one that **can hear** and does **not** have pku)?" What does their counselor tell them?

11) In humans, nearsightedness (N) is dominant to normal vision (n), and polydactyly (P) (having more than 5 fingers) is dominant to 5-fingered hands (p). A man has normal vision and is heterozygous for polydactyly; a woman is heterozygous for nearsightedness and has normal hands. If they marry, what is the probability of this couple having a child with normal vision and normal hands?



12) Jenny has red hair and freckles. We know that non-red hair (R) is dominant to red hair (r), and that freckles (F) are dominant to plain skin (f). She tells you that her mom has brown hair and freckles, and that her dad has red hair and plain skin. Furthermore, she says that her maternal grandmother (her mom's mom) had red hair and plain skin.

a) What is Jenny's genotype? _____

b) Jenny's mom is pregnant with a second child. What is the probability that Jenny will have a brother or sister with brown hair and plain skin? (do a Punnett Square to figure out the probability)